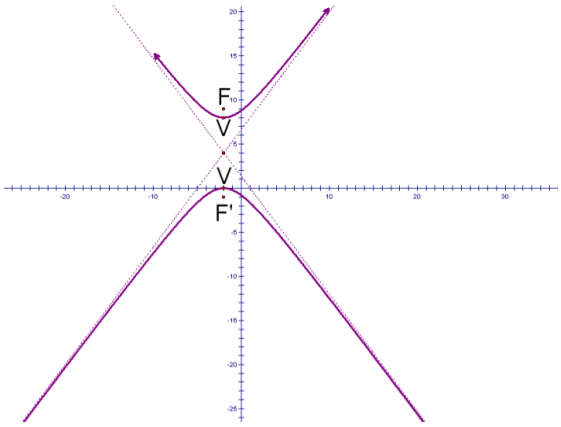
8.5 Hyperbolas

Hyperbola--the set of all points such that the absolute value of the difference of the distances from a point to two fixed points (foci) is a constant



gsp

Visual of construction

Focal radii--distances from the foci to a point P on the curve

Opens left/right

$$\frac{(x-h)^2}{a^2}-\frac{(y-k)^2}{b^2}=1$$

Opens up/down

$$\frac{(y-k)^2}{a^2}-\frac{(x-h)^2}{b^2}=1$$

a is not necessarily the largest, but first.

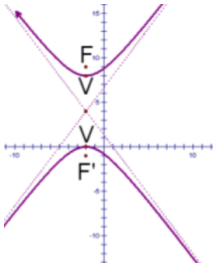
a = distance from center to vertex
b =
c = distance from center to each focus

Transverse axis --line segment of length 2a that intersects the hyperbola in 2 points (vertices)

Conjugate axis --perpendicular to transverse axis and has a length of 2b

$a^2 + b^2 = c^2$

asymptote --line such that the distance between this line and a point, P, on the graph goes to 0 as the distance between P and the center becomes greater and greater.



Equations of asymptotes

With a center of (0, 0).

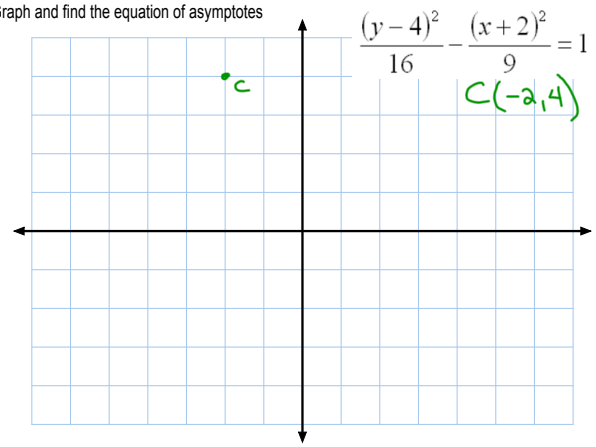
Left/Right	Up/Down
$y = \frac{b}{a}$ $y = -\frac{b}{a}$	$y = \frac{a}{b}$ $y = -\frac{a}{b}$

With a center of (h, k), the y-intercept is not zero, so you must figure it out.

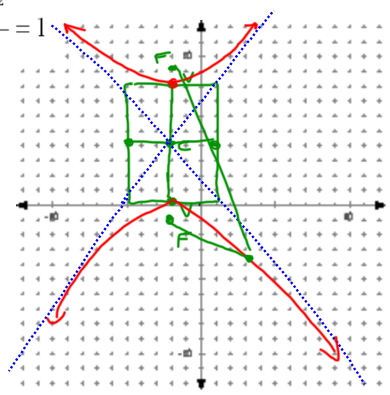
Graph and find the equation of asymptotes

$\frac{(y-4)^2}{16} - \frac{(x+2)^2}{9} = 1$

C(-2,4)



$$\frac{(y-4)^2}{16}-\frac{(x+2)^2}{9}=1$$



C(-2,4)

a=4

b=3

c=5

$a^2+b^2=c^2$

F(-2,9)

F(-2,-1)

a=4 C(-2,4)

b=3

$y=mx+b$

$y=\frac{4}{3}x+b$

$4=\frac{4}{3}(-2)+b$ $4=\frac{-4}{3}(-2)+b$

$\frac{12}{3}=\frac{-8}{3}$ $\frac{4}{3}=b$

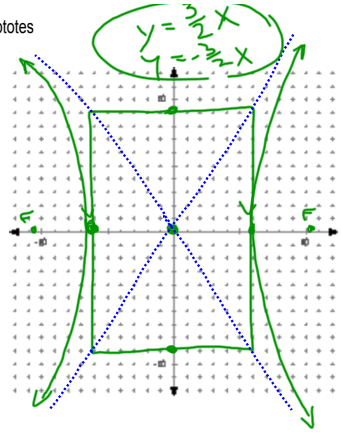
$\frac{20}{3}=b$

$y=\frac{4}{3}x+\frac{20}{3}$

$y=\frac{-4}{3}x+\frac{4}{3}$

Graph and find the equation of asymptotes

$$\frac{x^2}{36}-\frac{y^2}{81}=1$$



C(0,0)

a=6

b=9

$c=\sqrt{117}\approx 10.8$

$3\sqrt{13}$

$F(3\sqrt{13},0)$ V(6,0)

$F(-3\sqrt{13},0)$ V(-6,0)

Write the equation of a hyperbola with C(0, 0).
Horizontal transverse axis, a = 8, b = 5

$$\frac{x^2}{64}-\frac{y^2}{25}=1$$

Write the equation of a hyperbola with F(10, 0) and F(-10,0). 2a = 16

$c = 10$
$a = 8$

$C(0,0)$

$$\frac{x^2}{64} - \frac{y^2}{36} = 1$$

Write the equation of a hyperbola with V(1, -2) and V(1,2). b = 2

HW
p445-446
11-19odd, 23, 31,33

hyperbola_trans_sketch.gsp